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AN ESSAY ON DENTAL SURGERY

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Prize Essay of the Miss. Valley Ass. of Dental Surgeons.

AN ESSAY

ON

DENTAL SURGERY,

FOR

POPULAR READING,

By GEO. WATT, D. D. S., M. D.

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TO THE DENTAL PROFESSION.

The following is the Prize Essay of the "Mississippi Valley Association of Dental Surgeons." It was referred to the undersigned committee, with directions to print, in the cheapest possible form, and circulate to the profession, requesting all who receive it to make such corrections and suggestions as they think proper, and forward the same to the chairman of the committee, as early as the first of February, 1856.

The object of the association is to have the Essay as nearly perfect as practicable before publishing. Those responding to the request will, accordingly, address the chairman of the committee, at Xenia, O.

GEO. WATT,	}	<i>Committee.</i>
JAS. TAYLOR,		
J. TAFT.		

ESSAY ON DENTAL SURGERY.

INTRODUCTORY.

That the teeth are among the most important organs of the human system, few seem to understand, and many are unwilling to believe. They are consequently neglected, become diseased, and are lost, even in early life, with a frequency really alarming to the philanthropist. Parents neglect their mouths, and their teeth become diseased, consequently the whole system is impaired, and debilitated constitutions are necessarily imparted to their offspring, whose teeth are, in turn, neglected and fall easy victims to decay, thus transmitting increased debility to succeeding generations.

Agencies of this kind have been at work for a long period, and the consequence is, that good teeth, though fondly desired, are seldom seen. Children's teeth often decay as soon as through the gums; unweaned babes are tortured with toothache, youths, of both sexes, are toothless, and young mothers, their stomachs not able to digest unmasticated food, tormented with dyspepsia and its train of ills, patiently drag out a life of misery, for the sake of their pallid nurselings, through whom their ills are to be transmitted to unborn races.

The correction of this state of affairs requires attention to the subject, a sense of its importance, and a knowledge of the remedy. The hope of the writer¹ is that these pages may facilitate so desirable a result. It would seem almost wild to hope for the time when youth and beauty will be unencumbered with false teeth, when health will bloom on the mother's cheek, and the rosy hue on the lips of childhood, yet obedience to the laws of life will not fail to produce such

results. Then will the extraction of teeth and the amputation of fingers be equally rare; then will the dental organs last through life, fulfilling the ends designed by the Creator.

The writer solicits the careful attention of the reader, while he endeavors in the following pages to illustrate and define the nature and importance of dental surgery.

Every exertion, whether of mind or body, causes a loss of tissue. There must, then, be a constant supply of material to make reparation. As the teeth perform an important office in this work, and, as their condition greatly depends on it, the process of nutrition will be briefly explained, and the organs concerned in it described.

Under the head of *dentition* the temporary and permanent teeth, and the constitutional changes induced by their development and eruption will be considered. Brief and practical suggestions will be given in reference to the care of the child's health, and the preservation of the teeth.

The utility and beautifying influence of the teeth depending very much on their position, great attention should be paid to the permanent set to insure regularity, beauty, and firmness of arch. This will form the subject of a distinct chapter.

As a healthy state of the gums and lining membrane of the mouth is essential to the preservation of the teeth, their morbid conditions and the remedies will be considered in place.

The concretions of the mouth, known as tartar or salivary calculus, will next receive attention, and then the principal diseases of the teeth themselves, after which a few practical hints on artificial teeth will conclude the subject.

CHAPTER I.

NUTRITION.

At birth the child possesses but the rudiments of the man. It must be fed and nourished to bring it to maturity. A great abundance of nutritive matter is required during the period of growth to develop and perfect all parts of the body. After this a regular supply of food is required to counteract the change constantly going on in the system, by which old and worn out atoms are removed, that their places may be supplied by new particles, derived from fresh material furnished by digestion. The agency by which this supply is afforded is called the *process of nutrition*.

Nutrition, then, is that vital process by which organs and tissues are nourished and developed, and by which they are maintained in the same general conditions of shape, size and structure which they have obtained by development and growth. By this process adult persons in health, preserve, for years, the same general outline of form, size, and features, though the several portions of their bodies are continually changing; particles decaying and being removed, new ones taking their places, and these in turn, dying and passing away to make room for their successors. No part of the body is exempt from this natural decay of particles; the skin, the nerves, the flesh, and the bones are all wasted by absorption and renewed by nutrition.

The source of nutrition is the blood. From this fluid each tissue derives those materials which it requires.

The blood is distributed to every part of the system. The vessels which carry it from the heart are called *arteries*, those which return it, *veins*, and the minute vessels between them are called *capillaries*. From these capillary vessels, the nutritive elements are distributed to the different tissues. Anything, therefore, which assists in the formation of blood, promotes nutrition.

As the nourishing principle is withdrawn from the blood. it is re-supplied from the food. If it be not furnished in sufficient quantity, it is evident that the body cannot be properly nourished. Imperfect nutrition is an essential condition of some of the most destructive diseases to which our race is liable. That commonly known as *consumption* is of this class.

Healthy blood is essential to the perfect accomplishment of nutrition. This can only be secured by a proper use of healthy food. It is necessary, then, to understand the nature of digestion—the process by which food is converted into blood. That the food may be properly digested, it must be thoroughly prepared before it enters the stomach. That of a solid texture must be ground by the teeth and commingled with the saliva. This process of preparation is called

MASTICATION.

When a chemist wishes to dissolve any substance rapidly, he pulverizes it, or brings it into a minute state of division, in order to expose the largest possible extent of surface to the action of the dissolving fluid. All soluble substances dissolve more readily when thus divided. Accordingly, digestion is rapidly performed in animals which masticate or chew their food perfectly, while, in those which swallow it whole, as the snake, several days are required. It is evident, then, that the food should be well masticated, before it enters the stomach, and the Author of our being has given us organs perfectly adapted to this end.

In most of the higher animals, mastication is performed by means of the teeth placed in the jaws and so arranged as to act against each other, with a cutting or crushing influence, according to the nature of the food acted upon. In man there are four classes of teeth, adapted to different purposes. The first, called *incisors*, have a thin cutting edge and are intended principally to divide the food. The second kind, called *cuspid*, or *canine* teeth, have a conical form, are longer than

the incisors, and are adapted to the seizing and rending of food. The third class, having two distinct *cusps*, or points, on their grinding surfaces, are called *bicuspid*s, and are adapted both to rending and grinding. The fourth variety, called *molars*, are fitted, by means of their flattened surfaces, for bruising or grinding the food.

The incisors are, from their position, often called front teeth; the canines are called eye-teeth, in the upper, and stomach teeth in the lower jaw; the bicuspids and molars are called simply double teeth, the last one being denominated the wisdom tooth.

The teeth are implanted in the jaws in accordance with their several uses. The incisors have a single root, of no great length, their action having but little tendency to displace them. The canines being liable to more violence, have larger fangs, deeply implanted in their sockets. The molars, whose action requires greater firmness and stability, have spreading roots, giving them a stronger attachment to the jaw. The teeth will be more fully considered in the next chapter.

The teeth are brought into action by the muscles which move the lower jaw. Its movements differ in different animals. In the carnivorous, the mouth merely opens and shuts, with a hinge-like action. In the herbivorous, as the ox or horse, the jaw possess a great degree of lateral motion, by which the food is ground between the rough surfaces of the teeth. In the gnawing animals, there is no lateral, but a very free back and forward motion, causing the teeth to act as a file or a rasp, enabling these animals to cut through nutshells, or other hard substances, to obtain their food. The jaw of man is possessed of all these motions, in a moderate degree, and is therefore adapted to the mastication of the great variety of articles which constitute his food.

During the process of mastication, the food is commingled with the *saliva*.

This fluid is secreted by three pairs of glands, from which

it is conducted by canals, or ducts, into the cavity of the mouth. The largest of these, called the *parotid* glands, are situated, one at each side, in the cheek, just below the ear; their ducts open into the mouth, opposite to the second molars of the upper jaw. The parotids are the principal seat of the disease called "mumps." The other salivary glands, from their situation, are respectively called *submaxillary* and *sublingual*; their secretions pass into the mouth through several orifices beneath the tongue. When the mouth is at rest, these glands secrete only enough to keep it moist, but the flow is greatly increased when food is taken and mastication commences.

The saliva not only softens and moistens the food, that it may be easily swallowed, but it also produces in it a chemical change, preparing it for digestion in the stomach. Experiments show clearly that the stomach acts more readily on the food when impregnated with saliva, than when moistened with water.

When swallowed, the food passes into the stomach.

THE STOMACH

Is an oblong, membranous sac, situated in the upper part of the abdomen, just below and partly behind the short ribs, extending across from the left to the right side. It has three coats, each performing a separate office in the work of digestion. Its external membrane is the same that lines the cavity of the abdomen and envelops all the organs contained in it. This membrane secretes a fluid which lubricates its surface, enabling the organs which it invests to glide smoothly over each other. The middle coat is composed of muscular fibres which traverse the walls of the stomach in various directions. By the alternate contraction and relaxation of these fibres, the food is rolled about and moved successively over every portion of the inner coat, which is called the mucous membrane. This membrane secretes a mucous, or slimy matter which protects the stomach from undue irritation by

its contents. It also furnishes the fluid in which the food is dissolved, called the

GASTRIC JUICE.

This fluid is a powerful solvent of all nutritious substances, and is secreted only when demanded by the introduction of food into the stomach. It is found only in the living stomach, and is indispensable to digestion.

When the digestion in the stomach is completed, the gastric fluid and the food are completely commingled and converted into a pulpy mass, called *chyme*, which then passes through the lower orifice of the stomach into the small intestine. Here it meets with the bile, the secretion of the liver, and also with a fluid resembling saliva, secreted by a gland called the *pancreas*. This mixture results in the production of a whitish fluid, with a sweet, and somewhat saltish taste. This fluid is called *chyle*, and it is the nutritive part of the food. The residue becoming less fluid, passes into the large intestine and is excreted from the system.

The intestines, like the stomach, are composed of three coats. Numerous small glands are situated in the inner, or mucous membrane, which take up the chyle, or nutritive matter, and pass it into minute vessels called *lacteals*.

The lacteals commencing in the small glands mentioned above, empty their contents into a reservoir, situated in front of the spinal column, called the *thoracic duct*. This duct is about the size of a large quill. It passes upward to the height of the collar bone, then turns forward and downward, and empties its contents into the blood, as it returns from the head and upper extremities to the heart. The chyle thus commingled with the blood, passes with it to the heart, is propelled to the lungs, returns to the heart and is dispersed through the entire system, supplying all the materials demanded by growth and nutrition.

CHAPTER II.

DENTITION.

The teeth performing an important office in the process of nutrition, that function by which life itself is sustained, may well claim our attention and consideration.

That part of the tooth not covered by the gum is called its *body* or *crown*. It is bounded by a narrower portion called the *neck*, which separates it from the part contained in the socket, called the *root* or *fang*.

The parts of a tooth important to be considered, are the *pulp*, the *bone*, *ivory* or *dentine*, and the *enamel*. The pulp is a soft, highly sensitive substance, of a reddish gray color, occupying the central cavity of the tooth. It is highly supplied with blood-vessels and nerves, and is the medium through which the crown of the tooth principally receives its vitality. Irritation of the pulp is a frequent cause of toothache, as will appear in a subsequent chapter. Its removal or destruction is popularly called "killing the nerve."

The pulp is the rudiment from which the tooth is developed. In infantile or foetal life, it is very soft, gelatinous, and semi-transparent, covered by a thin, delicate membrane attached to it by vessels. It is then very liable to injury, both from local causes and from those which act through the general system. Unless it be preserved in a healthy state, a well-organized tooth cannot be developed from it. The importance of attention to the child's health is therefore manifest.

The bone, or dentine, is a very hard dense substance, constituting the principal bulk of the tooth. It consists of concentric layers, and forms the cavity in which the pulp is lodged. It is composed of animal and earthy matter, about twenty-eight of the former to seventy-two of the latter, the proportions not being uniform. In the teeth of young persons the animal matter is very abundant; the proportion of earthy material increases with the age. The principal earthy ingredient is phosphate of lime.

The enamel, the hardest of all animal substances, covers the body and extends to the neck of the tooth. It has a smooth, glossy surface, and is generally of a pearly, milk-white color. It is thickest on the parts of the teeth most exposed to friction, is much harder in some constitutions than in others, and generally increases in hardness as life advances. Its structure is fibrous, the fibres radiating toward the surface of the tooth, thus securing the ability to sustain great pressure. The enamel, like the dentine, consists of animal and earthy matter, one of the former to ninety-nine of the latter. The proportions, however, vary with age and temperament.

The teeth are attached to the jaws, and held in place by a strong fibrous membrane, which invests the fang and lines the socket. This membrane is called the *periosteum*, and is the same which envelops the bones of the entire system, sending numerous minute vessels into them. It is the medium by which the nutritive fluids are transmitted to the root of the tooth. When inflamed it gives rise to a very annoying form of toothache.

The remarks in this chapter, thus far, apply, equally, to the temporary and permanent teeth. It is necessary to notice some of the characteristics of each class.

The temporary teeth are twenty in number, each jaw containing four incisors, two canines, and four molars, while the permanent set consists of four incisors, two canines, *four bicuspid*s, and *six* molars to each jaw. The pulp cavities are relatively larger in the temporary than in the permanent set, and the teeth are generally much smaller, and less firm and solid than the permanent ones. The molars of the child are larger than the bicuspid>s which succeed them, and resemble, very nearly, the permanent molars, having roots similar in number, but flatter, thinner in proportion, and more divergent.

The importance of the teeth has been inferred from their office, and from the relations they sustain to the general system. It is also manifest from the beautiful and complex arrangement provided by the Author of our being for their development. Traces of this provision may be observed as early

as the sixth week after conception. A week later, the first tooth-germ makes its appearance, and, by the close of the tenth week, the germs of the ten temporary teeth are observable. The germ is, at this time, a mere granular papilla, enclosed in a membranous follicle. By the fourteenth week, the follicle is converted into a sac, and the papilla into a pulp, which has been already described.

About this time, provision is made for the production of the ten anterior permanent teeth, and by the fifth month, their germs are found immediately behind those of the temporary teeth. Previous to this ossification, or the formation of bone, has commenced in the temporary teeth. The ossification of a tooth proceeds from the exterior surface, inwardly, layer after layer is formed, until but a small residue of the pulp remains situated in the central cavity, the walls of which are lined by a delicate membrane, which transmits the vessels and nerves to the bony structure of the tooth.

The pulps of the temporary teeth are partially ossified and covered with enamel, at birth, yet they still occupy their bony cells beneath the gums. In early existence the infant needs no teeth, and in the wisdom of Providence it has none. The mother's milk is then its appropriate food, and it can take no other, but at the risk of health and comfort. But in process of time its system requires a diet better adapted to its increasing energies. Vital agencies, as though conscious of this demand, proceed to make openings in the gum through which the teeth, obedient to the laws of life, gradually emerge.

The eruption of the temporary teeth varies, in regard to time, with the constitution and health of the child. It would be difficult to give very precise information on this subject. The following table is, perhaps, sufficiently definite to be useful :

The central incisors appear from 5 to 8 months after birth.

" Lateral "	" "	" 7 to 10 "	" "	" "
" First molars "	" "	" 12 to 16 "	" "	" "
" Cupids, or canines "	" "	" 14 to 20 "	" "	" "
" Second molars "	" "	" 20 to 36 "	" "	" "

There will be frequent variations from any general rule which can be given. Some children have teeth at birth, others have none till long after the usual periods. The lower teeth generally appear from one to three months before the upper, and sometimes the upper appear first.

The eruption of the teeth, commencing when the system is in its tenderest state of infancy, and prone to disorder from the slightest influences, often causes severe pain and irritation. First dentition is generally regarded as the most critical period of life, yet the whole process is often completed with but trifling inconvenience. The immediate cause of the irritation is the pressure of the teeth upon the gums, in forcing their way out. When the absorption of the gums and the growth of the teeth correspond with each other, the pressure is scarcely perceptible and but little pain is produced, but when the former is retarded, intense suffering is the result. This suffering is paroxysmal, seldom lasting more than two or three hours at a time, the system being thus enabled to rally its exhausted energies during the period of repose.

When the irritation is merely local, it subsides as soon as the teeth appear through the gums. The principal unpleasant local symptoms are tenderness and slight swelling of the gums. The increased flow of saliva acts beneficially, by diminishing the inflammatory action of the parts. The local irritation is often so severe that it impairs the functions of other parts of the system. The child becomes feverish and stupid, diarrhoea often follows, and various forms of eruptive disease appear around the mouth, on the neck and face, and sometimes over the whole body. All the diseases of infancy are aggravated during dentition. In extreme cases the diarrhoea becomes copious and persistent, the stomach becomes irritable, great emaciation takes place, convulsions follow, and death closes the scene.

The primary and immediate cause of the irritation being the pressure produced by the tooth, the appropriate remedy

is at once clearly indicated. *The tension is to be relieved by lancing the gums.* This operation should be resorted to, even when the tooth is still deeply imbedded in the gum, if the parts be congested or inflamed, for the tension is often much augmented by an increased amount of blood in the part, and no mode of relief is so rational as that which permits the superabundance to escape. If the wound in the gum heals before the tooth protrudes, there need be no apprehensions, for the cicatrix or scar will absorb and make way for the tooth more readily than the natural tissue. The operation should be repeated, if necessary, but, in general, if delayed till actually required, a free incision will be followed by the protrusion of the tooth. There is no danger of injuring the embryo tooth, by the proper performance of this operation, for it will be remembered that ossification or the formation of enamel commences previous to birth, and has attained to a good degree of advancement before the period of eruption.

The relief thus afforded is generally prompt and decisive. The operation itself is simple, void of danger, and causes but little pain when properly performed.

The constitutional symptoms, arising from painful dentition, are to be treated according to their nature and the circumstances of each case. When they become serious, a judicious physician should be consulted, and quack nostrums avoided.

From the importance of proper mastication, it is plain that the premature loss of the temporary teeth is disastrous to health, yet many suppose that, as they are soon to be superseded by a better and stronger set, it matters but little whether they remain till the natural time of shedding, or are lost at an early period. The want of knowledge on this point, and carelessness in regard to it, have been productive of serious consequences.

By the decay of these teeth, the lining membrane or pulp is often exposed, and becomes inflamed, causing pain, swelling, abscess, and, sometimes, disease of the bone. These

morbid conditions influence all the adjacent organs and tissues, including the germs of the permanent teeth, which, it will be remembered, are situated beneath and behind the roots of the primary organs. This morbid influence may interrupt or impair the process of ossification in the new tooth, and may also produce an acrid state of the surrounding fluid, causing it to corrode the enamel.

The premature loss of the temporary teeth is a frequent cause of irregularity of the permanent set, which is, of itself, a serious misfortune. They should, therefore, be preserved, if possible, till required to give place to their successors.

The constitutional effects of decayed teeth, both temporary and permanent, and the preventive, palliative, and curative treatment of their principal diseases will be considered in a succeeding chapter.

SECOND DENTITION.

We have seen that the infant needs no teeth and has none. We see the same wisdom displayed in regard to the teeth of children. Their food being principally vegetable, requires but little mastication to prepare it for the stomach. Accordingly, we find their teeth few in number, and of small size, yet admirably fitted for the mastication of their appropriate food. On the other hand, the adult, whose food is composed of animal as well as vegetable substances, requires a more numerous and substantial set.

The gradual elongation of the jaw gives room for the increased number and size of the permanent organs, and so admirable is the provision of Providence here, that before any of the temporary teeth are shed, four of the second set make their appearance. These are the first permanent molars, and they appear immediately behind the temporary molars, about the fifth or sixth year. From the early period of their eruption, they are often mistaken, by parents for temporary organs. Dentists are frequently told that the child has never shed all its double teeth, and, on examination, find the decidu-

ous molars gone, their places occupied by the bicuspid, and the first permanent molars fully developed and in proper place. Those having the care of children would find it convenient to remember that all back of the bicuspid are permanent teeth.

The shedding of the temporary teeth is an interesting operation, effected in accordance with an established law of the system. The permanent organs are about to appear, and a way must be provided for their eruption. Accordingly, the roots of the temporaries are gradually removed by absorption, and, of course, the teeth become loose and fall out. They are lost about in the order of their first appearance, and when one pair is removed, there is usually time for the permanent pair to come forward and fill the space before the next ones are shed.

The eruption of the permanent teeth is, in general, attended with very slight irritation, the wisdom teeth being the only ones which cause any inconvenience. The constitution has, by this time acquired sufficient strength to resist slight morbid influences, and the gums offer but little resistance to the eruption of the permanent set, as they appear almost immediately after the removal of the temporaries.

The periods for the eruption of the permanent teeth, like those of the temporary, are very reliable. The following table is as definite, in regard to their appearance, as anything that can be offered:

First molars,	from 5 to 6 years.
Central incisors,	" 6 to 8 "
Lateral incisors,	" 7 to 9 "
First bicuspid,	" 9 to 10 "
Second bicuspid,	" 10 to 12 "
Canines,	" 11 to 12 "
Second molars,	" 13 to 14 "
Wisdom teeth,	" 16 to 22 "

Every one will be familiar with exceptions to the above table. The canines often precede the second bicuspid, and the wisdom teeth, sometimes appear as late as the fortieth

year, and perhaps later. A majority of cases, however, will be found to fall within the limits of the table.

Although much injury may be done, by improper interference with the teeth, during second dentition, yet it is important that they receive due care and attention. The most beautiful countenance and the finest features may be rendered hideous by an irregular and distorted set of teeth. By such arrangements, the gums and teeth are rendered more susceptible to morbid impressions. Indeed, the only way to preserve such teeth is to correct the irregularity. The mode of doing this will be described in the next chapter.

The mouth should be frequently examined, by a careful and scientific practitioner, from the shedding of the first temporaries, till the completion of second dentition. The practice of calling on a physician, or a resolute neighbor, to extract a temporary, to make room for an adjacent new tooth, cannot be too strongly condemned, for in general, more mischief is done by the too early removal of the temporary teeth, than by permitting them to remain too long.

It is true that a deciduous tooth must sometimes be extracted for the above reason, yet no one who fails to give dental science his undivided attention, is fit to be trusted with so important a matter. Proper attention, by a judicious and well informed dental surgeon, will almost invariably, secure a well arranged and beautiful set of teeth.

Nature is generally able to complete her task, in the process of dentition, yet, at times, she requires aid. In such cases, and such only, the services of the dentist is needed. Improper attention or neglect will be followed by consequences fatal to the teeth.

CHAPTER III.

IRREGULARITY OF THE TEETH.

The emtporary teeth encountering no serious obstructions in their eruption through the gums, seldom deviate from their natural positions in the dental areh. The following remarks, therefore apply only to the permanent organs.

The first and second molars, like the temporaries, meet with no obstructions, in their progress through the gums, and aecordingly, are seldom found in a wrong position. Want of room sometimes prevents the wisdom teeth from taking their proper places. But, of all the teeth, the incisors and canines are the most liable to take a wrong direction.

The anterior molars being the first of the second set to assume their plaees, it is plain that the ten anterior teeth, in each jaw, are limited to that part of the arch occupied by the deciduous set, and if this space be too narrow, irregularity follows of course.

The bicuspid, being smaller than the temporary molars, are seldom crowded, and are therefore generally found in their proper places.

As the ineisors and bicuspid, preeede the canines, the latter are more liable to be forced out of place then any other class of the teeth. They often appear either before or behind the arch. In the former ease, which is the most frequent, they produue a frightful deformity, and become a source of great annoyance to the lip; in the latter, though the deformity is less conspieuous yet the inconvenience is greater.

The upper incisors present a greater variety of irregularity than any of the other teeth. When they are much inclined inward, the lower teeth shut outside of them, thus increasing the difficulty in their management. Sometimes they protude forward till the lip fails to eover them. This is an unsightly deformity and somewhat difficult to remedy. But it is un-

necessary to enumerate. All have observed well marked cases of almost every possible variety. Sufficient to say that judgment and skill in the operator combined with patience and perseverance on the part of the patient, applied at the proper time, will overcome the difficulties of every case.

TRE A M E N T .

In the treatment of irregularity, as in other morbid conditions, the first indication is the removal of the cause. Hence if the deciduous teeth, by remaining too long, are a source of difficulty, they must be instantly removed. Again, if want of space be the cause, it is sometimes necessary to remove a permanent tooth from each side. This can often be avoided by delay, for the teeth increase none in size after their eruption, while the jaw, like the other bones, continues to expand and elongate for some years after the appearance of the anterior teeth.

When it becomes necessary to remove any of the permanent organs it is all important that the proper ones be selected. The lateral incisors and canines are unfortunately the most frequent victims. This arises from a want of information in regard to the regulation of the teeth. None would be willing to sacrifice teeth so important to personal appearance, if they knew that a little attention would arrange them in their proper places.

When the patient has arrived at proper age, and there is a lack of room, a bicuspid or first molar, on each side should be removed. If decayed, as they often are, the molars should be removed, in preference to the bicuspids, and the first bicuspids should be spared, when the removal of the second will answer the purpose. The selection should be left in all cases, to a conscientious and intelligent dentist.

The removal of the cause is often all that is necessary, as the natural efforts of the constitution tend to produce regularity. But in many cases nature must be assisted. The judicious practitioner should then be consulted, as well as in all cases of doubtful character.

It is a law of the animal economy that pressure on any tissue causes its absorption. This and the fact that new material is deposited wherever needed, by the process of nutrition, enable us to correct the irregularities of the dental arch. The causes being removed the constant application of gentle pressure induces the rapid absorption of one side of the socket, while the other is filled up and strengthened by a new bony deposit. This pressure is made by a variety of appliances to the teeth, such as metallic springs and plates, ligatures of thread, or Indian rubber, wedges, inclined planes. etc. etc. When the deviation is but slight, frequent pressure in the proper direction, with the finger, will correct it, but, in all difficult cases, the services of a good dentist will be required. It is often necessary to support the tooth, for a time, after it has assumed its proper position, that the new bony deposit around it may have time to consolidate.

From the above, it follows that irregularities of the teeth should be corrected while the nutritive functions are in vigorous exercise, which is the case only in early life. Pressure on the tooth in after life, will it is true, excite absorption of the socket, but there will be no corresponding deposit, and of course, the tooth will be loosened and lost. If we begin too early, we lose the advantage derived from the expansion of the jaw. The proper age is therefore an important consideration.

When there is sufficient room, the irregularity should be corrected as soon as observed. And when it is necessary to wait for the expansion of the jaw, it is not prudent to delay beyond the fourteenth or sixteenth year. If there be, at this age, a crowded denture, it is proper to remove a tooth from each side, as directed above. It is true that the position of a tooth may be corrected long after this, but the operation is more tedious, difficult and uncertain.

The lower teeth are perhaps less liable to irregularity than the upper, and their regulation is less difficult.

CHAPTER IV.

THE GUMS AND MUCOUS MEMBRANE.

The inner surface of the lips, the mouth and nose, the air-tubes, and the whole intestinal canal, are lined with a tissue called *mucous membrane*. Its structure resembles that of the skin, of which it is a continuation. As the lining membrane of the stomach and bowels, it was alluded to in the chapter on nutrition. It is now spoken of only as found in and about the mouth.

Its surface is supplied with numerous follicles or minute glands, which furnish the mouth with its mucus. As it passes over the alveolar ridge its texture is changed and it receives the name of *the gums*.

The gums are composed of dense thick mucous membrane firmly adhering to the periosteum, or investing membrane of the alveolar processes. They closely surround the necks of the teeth, where they are folded back upon themselves, forming a free border, with a scalloped appearance. The texture of the gums, externally, is similar to that of ordinary mucous membrane, but their internal structure has a cartilaginous appearance.

In a healthy state, the gums are hard and firm, and have but little sensibility, but they are very tender and irritable when diseased.

In young persons of good constitution the gums have a pale red color, a rough surface, a firm consistence, well defined and neatly festooned margins, the mucous membrane presenting a fresh, lively appearance. While the general health remains good, and the mouth is kept free from local irritants, such will be the general characteristics of the gums, but they are liable to great changes through the influence of morbid agencies.

In some constitutions, the gums have naturally a deeper color than the above described. Their structure is less firm,

their margins thicker, and their surface smother. Such are more prone to disease, than those previously described, and their diseases are more obstinate.

In persons predisposed to scrofula, the gums are pale, their margins are thin and neatly festooned, and their texture is usually firm, though their attachment to the necks of the teeth appears weak.

In scorbutic constitutions, the gums are of a reddish brown color, with thick and irregular margins; they are inclined to turgidity, are very irritable, and readily take on disease. Severe disease is more likely to supervene in this, than in any of the above mentioned varieties.

In all temperaments the natural color of the gums is much modified by the state of the general health. In plethoric persons they exhibit a deep color, corresponding with the richness of the blood, while in exsanguined and chlorotic cases, they are correspondingly pale. In jaundiced persons they show the yellow tinge, and in short, they sympathise with every condition of the system. And it might be added that this sympathy is mutual, for all parts of the system are influenced by their condition. Being formed of the membrane which lines the entire digestive apparatus, and situated so as to come in contact with every portion of the food, it is evident that their diseased condition directly influences the nutritive functions upon which, as we have seen, the continuation of life depends.

The alveolar processes, those portions of the bone which form the sockets, are often diseased, in connection with the gums, and frequently from the same apparent causes. It will, therefore be necessary to speak, sometimes, of the diseases of both in the same connection.

INFLAMMATION OF THE GUMS.

The disease commonly, but incorrectly, called *scurvy*, is the most common disease of the gums. It possesses the ordinary characteristics of inflammation, and, besides some im-

portant traits resulting from the modifying influence of local causes. It requires for its development, the combined action of local and general causes, for though many local agents produce inflammation when applied to the gums, or any other part, yet in a vigorous healthy constitution, the distinctive traits of this disease will not be manifested.

When thus diseased, the gums are swollen and spongy, of a dark flored or livid color, their edges thick and prominent, discharging matter on pressure. They bleed from the slightest injury, are usually very sensitive and sometimes painful.

When all parts of the mouth are alike healthy, this disease mostly appears first about the lower front teeth, but it is very apt to commence in the vicinity of decayed, loose, or dead teeth or fangs, or about these irregularly arranged. From the point of attack, it extends to other parts, its progress depending on the age, health, constitution, and habits of the patient, and on the nature of the local irritants inducing it.

The disease may continue for months without much change, differing but little from the above description, an offensive breath and an unhealthy state of the secretions of the mouth being its most unpleasant results. In patients of good constitution and correct habits, the disease may be checked, in this stage, by merely removing the local irritants, or it may be appropriately treated, and the mouth, in any ordinary constitution, fully restored to its original healthy condition.

But when allowed to continue, and especially when favored by a constitutional tendency, the inflammation extends to the alveolar and dental periosteum, the margins of the gums and the alveolar processes are gradually wasted away, bony matter is often deposited in the bottom of the sockets, and the teeth are necessarily loosened and lost.

As this disease impairs the function of mastication, and vitiates the secretions of the mouth, its pernicious effects are, by no means merely local. Vital organs are often implicated and the general health seriously injured.

Sometimes the margins of the gums recede but little, while the walls of the sockets are almost totally destroyed. In these cases the roots of the teeth are denuded and protude through the gums, becoming a source of great irritation to the surrounding parts. The primary teeth are more frequently found in this condition than the permanent.

The causes of this disease are, as we have seen, both general and local. Plethoric persons are more liable to it than those of the opposite character, and it is more likely to attack the aged than the young. Fever, the improper use of mercury, debauchery, intemperance, and every thing which induces an unnatural condition of the mucous tissues, favors its production.

The local causes embrace every thing which produces local irritation in the gums. Of these may be mentioned, aching, decayed or dead teeth, or roots, irregularity, tartar, or other extraneous substances on the teeth and gums, vitiated secretions of the mouth, the use of improper dentifrices, artificial teeth badly inserted, the use of improper metals in the mouth, either as filings or plate.

TREATMENT.

The prominent indication in this, as in all other diseases, is the removal of the cause. Accordingly all dead teeth must be removed, the mouth must be kept free of tartar, vitiated secretions, and all extraneous substances, tobacco included, aching teeth must be extracted or relieved, decayed ones filled, and irregularities corrected.

For most of this treatment, the services of the dentist will be required; but, without close attention and the most rigid cleanliness on the part of the patient, there is little hope of success. The mouth should be thoroughly cleansed at least five times a day. This is to be done by a brush, followed by a proper toothpick, the edge of a silk handkerchief, or floss silk, for cleansing between the teeth.

In some cases, the removal of the dead teeth, tartar, roots, &c., will require several sittings. The patient should mani-

fest the utmost promptness and punctuality in regard to the suggestions of the operator, for the loss of the teeth, sooner or later, is the inevitable result of neglect.

It is of the utmost importance that the disease receive attention in its earliest stages, for after the margins of the gums have once receded from the necks of the teeth, they are never restored. It is true the disease may still be cured, but the sockets, being partially destroyed, form a very imperfect support to the teeth, and, of course, they fail properly to perform their part in the function of mastication. Besides, the exposed necks of the teeth afford a lodgment for tartar and other extraneous substances, thus increasing the tendency to disease.

The turgidity of the gums is much relieved by the loss of blood incident to the removal of the dead teeth, tartar, &c. The bleeding should, in many cases be encouraged, by holding warm water in the mouth, and the gums should be freely scarified with a sharp knife or lancet, from time to time, to relieve the loaded state of the vessels, as the cure progresses.

After the inflammation has somewhat abated, benefit will be derived from the use of tonic and astringent washes. To obtain these prepared according to the nature of the case, a reliable dentist should be consulted. The various nostrums should be zealously avoided. Only general principles of treatment can be here laid down. Formulas and recipes would be worse than useless, as each case requires treatment, to a great extent, peculiar to itself, and adapted to the constitution of the patient.

This disease has been noticed thus at length, both on account of its prevalence and its importance. It is probable that more teeth are lost, at least in advanced life, by this, than by all other diseases. It is apt to be neglected, because, in its earliest stages, it causes but little pain or inconvenience. Proper attention, in its earliest existence, is the only safe or sensible course.

ALVEOLAR ABSCESS, OR GUMBOIL.

The primary seat of this disease is within the socket, and, hence, the gums are only secondarily affected. It is a common disease, and its effects are very injurious, not only to the adjacent parts, but to the general health.

In its forming stage, it causes a deep seated, throbbing pain, which continues, with but slight intermissions, till supuration takes place.

Soon after the commencement of inflammation in the socket, there is an effusion of a substance called coagulable lymph. This soon consolidates, and attaches itself to and around the apex of the fang, forming a sac, which, as suppuration progresses, distends and presses against the walls of the socket, causing them to be absorbed, till, finally, an exit is made through the process and gums, for the escape of matter.

Sometimes, however, the matter escapes through an opening made in the cheek, or the roof of the mouth; sometimes it traverses the jaw, to a considerable extent, destroying the periosteum and thus causing the death and exfoliation of the bone. An abscess originating in the socket of a lower wisdom tooth is more likely to give trouble than one in any other position. If its formation here cannot be prevented, the tooth should be, at once, removed.

The immediate cause of this disease is inflammation of the investing membrane, or periosteum of the root. The secondary causes are these which excite inflammatory action in this membrane. Among the latter, inflammation, or the destruction of the pulp, or lining membrane, holds a conspicuous place. Decayed roots, and those on which artificial teeth are mounted, are a frequent source of disease, and it frequently results from filling teeth in which the pulp is dead and but partially removed.

TREATMENT.

The principal treatment of this disease should be preventive rather than curative; for, after the abscess has formed

and matured, it is difficult to effect a permanent cure, except by removal of the tooth or fang producing it.

When, therefore, there is much reason to apprehend an abscess, cooling laxatives, rest and light diet should be immediately resorted to, and stimulants should be avoided. The gums should be freely scarified and the bleeding encouraged. After the inflammatory symptoms have somewhat abated, astringent washes to the mouth, and mustard drafts, or other irritants to the face, may be of service.

As soon as matured, the abscess should be opened with a lancet or sharp pointed knife, and this should always be done within the mouth, if at all possible. When opened through the cheek, it is healed with difficulty, and, besides, produces an unsightly scar.

If there be a general tendency to inflammation, appropriate constitutional treatment will be required. The advice of a good practitioner should be sought, when one is accessible. In very many cases it becomes necessary to extract the offending tooth.

CHAPTER V.

SALIVARY CALCULUS, OR TARTAR.

Tartar, or salivary calculus, is composed of earthy salts and animal matter. The relative proportions of its constituents vary with its solidity, and with the health and temperament of the individual; hence, no two analyses give the same results.

Its color is not uniform. Sometimes it is black, some times yellow or brown, and sometimes white. It differs also in density. The black is the hardest, the white the softest, while the other is hard or soft, according to its approximation to the black or white.

In good constitutions it is of a dark color, dry, hard, small in quantity, and adhering firmly to the teeth. The general health is but little, if at all affected by its presence. A slight

irritation of the margins of the gums, in contact with it, seems to be the only injury resulting from it.

In constitutions naturally good, but impaired by privation, debauchery, or intemperance, there is found a black tartar materially different from the above. It is very black, hard and rough—adheres firmly to the teeth, and is covered with a viscid and very offensive mucus. It exerts a very injurious influence on the general health, and produces inflammation, swelling and suppuration of the gums, in short, all the evils detailed under the head of “Inflammation of the gums.”

The dark brown tartar is softer than either of the black varieties. It is more fetid than the first, but is less so than the last. It adheres firmly to the teeth, and its effects are similar to those of the last mentioned kind, but are less violent. The pale, or yellow brown, is still softer, less adherent, and, perhaps, less hurtful.

The white seldom collects in large quantities. It is very soft, and produces but little mechanical irritation, yet it vitiates the fluids of the mouth, and, from its very softness, affords them a lodgment in contact with the teeth, to which it thus becomes more deleterious than any other class of tartar.

These varieties of tartar are all found most abundant on the teeth opposite to the mouths of the salivary ducts, and hence the lower incisors and upper molars, should be carefully watched.

There is another substance, deposited on the teeth, which is generally included under the head of salivary calculus, and till more is known of its nature, it may, perhaps, as well be so classed. It is of a dark green color, and is mostly found on the anterior surfaces of the upper front teeth. It has the appearance of a stain on the enamel. Children and youth are more subject to it than adults. Authors generally state that it is exceedingly acrid, and that it decomposes the enamel. This may be true, yet it is just as probable that the substance itself is entirely inert, and that it is precipitated

on the teeth by the decomposition of a compound substance, of which it formed a component part, the acid of which combines with and corrodes the enamel. It is certain that, where it exists for a length of time, the enamel and dentine are rapidly destroyed. The difficulty of obtaining it, in a pure state, has prevented a reliable analysis of it.

The earthy materials of salivary calculus are held in solution by the saliva, and are precipitated on the surfaces of the teeth opposite the mouths of the ducts from which it flows. Sometimes it is so abundant that all the teeth are nearly covered with it.

The effects of salivary calculus have been already hinted at. They are always pernicious, though sometimes far more so than others. A depraved condition of the fluids of the mouth, inflammation of the gums and its consequences, are its ordinary results. Foul breath, dyspepsia, cough, diarrhæa, headache, etc., are frequently produced by it. The violence of these symptoms depends on the quantity and kind of tartar, and on the constitution of the patient.

Close attention to cleanliness of the mouth will prevent the deposit of tartar; but after it has accumulated, the gums become so sensitive, that the use of the brush is painful, and the rules of cleanliness are apt to be disregarded. Its increase is then very rapid, and the odor exhaled by it becomes intensely nauseating and offensive.

In treating the effects of this deposit, the first indication is its removal from the mouth. For this, the services of the dentist will be required. The resort to professional aid should not be delayed, for the consequences of neglect are serious, and it need not be through dread of the operation; for its removal causes but little, if any pain.

All competent dentists are supplied with a variety of instruments for the removal of this deposit, so constructed that they may be readily applied to all parts of the teeth, thus enabling them to remove every particle from the mouth. It

is important that this should be done, for if any portion is left, it serves as a nucleus for fresh deposits.

The entire removal of the tartar sometimes requires several sittings. The patient should be punctual and attentive in such cases, for without his co-operation the best dental skill will avail but little.

The inflammation of the gums, incident to the presence of tartar, is to be treated as directed in a previous chapter, and the constitutional symptoms, according to their nature and the constitution of the patient.

The green deposit is removed with more difficulty than any of the varieties of the salivary calculus. Some take it off with instruments, others remove it by friction with pumice stone, or some similar substance. By either method a small portion of the enamel is removed, but this cannot be avoided, nor is it very desirable that it should be, as, from the abrasion of the enamel accompanying the deposit, a rough surface would be afforded for the lodgment of the extraneous substances. This roughness is partially removed by either mode of operating, and the surface may be still farther improved by the use of a burnisher.

Before closing this chapter, it will be well to remark that salivary calculus should be removed by mechanical means, and by these only. Empirics and impostors have flooded the country with tooth powders, washes, pastes, etc., to soften and dissolve it. They are warranted to remove the tartar and whiten the darkest teeth by a single application. Unfortunately, they generally do all they promise. They not only dissolve the tartar, but also the enamel and the tooth itself, if persisted in.

An acid is the active principle of almost all of these nostrums. All substances which cleanse and whiten the teeth so rapidly, do it by chemical action, and anything capable of thus dissolving the tartar, will also act on the teeth. Those nostrums hawked through the country by peddlers, puffed by placards, and insinuated into favor by the paltry present of an almanac, should therefore be shunned as poison.

The only safe course in this, as in all other diseases of the mouth, is to select, as your family dentist, an honest and intelligent practitioner; go to him for advice when needed, and a recipe from him, filled by a druggist of like character, will cost less than a nostrum, and, besides, will be safe and serviceable.

CHAPTER VI.

DISEASES OF THE TEETH.

Most persons of observation have noticed well defined points of difference in the teeth of different individuals. These variations in size, form, color and arrangement, are all indicative of their susceptibility to disease.

Teeth possessing an abundance of earthy salts are generally of a dull white color, of medium size and short, with thick cutting edges. They gradually assume a yellowish appearance, as age advances, are very hard, and, with reasonable care, seldom decay.

A second class of teeth have a bluish, bleached appearance, and are longer than the preceding. The incisors of this class are thin and narrow, the canines round and pointed, the molars and bicuspid small and deeply indented. They are easily corroded, very sensitive, and, without great care, are usually lost in early life. They are more common to females than males, and are indicative of a constitution naturally weak.

A third class have large crowns, rough and irregular faces, and are of a muddy white color. They decay very readily, and are liable to be attacked at almost every point, but especially in their indentations, which are numerous and deep.

The appearance of the teeth is not indicative of the present state of the constitution, but of its condition at the time of their development and ossification.

The above classification is somewhat general, but space will not permit minuteness. It is hoped that it will, to some

extent, enable the reader to decide on the character of his own teeth. If they are found to be of the first class, they are well worthy of his best attention, if of the second or third, nothing less will long preserve them.

The most common, and, perhaps, the most important of the diseases of the teeth is

C A R I E S .

This disease is of frequent occurrence, and is fatal in its tendency. A tooth affected by it, in common parlance, is said to be "rotten" or decayed. It is often rapid in its progress, and insidious in its attacks, involving the teeth in ruin before their possessor is at all alarmed for their safety.

It commences on the outer surface of the tooth, and its presence is usually first manifested by a dark or opaque spot on the enamel. If this be removed, the bone exhibits a black, brown or whitish appearance. From the point of attack, it progresses toward the centre, till it reaches the pulp cavity, the external walls sometimes remaining nearly perfect, till the whole internal structure is destroyed.

The disease most frequently commences in the depressions on the grinding faces of the bicuspid and molars, and on the approximal surfaces or the parts of the teeth in contact with each other, but it may attack any point on the crown or neck of the tooth.

The decayed portion is of a darker color, and more solid in very hard teeth than in those which are softer. The color of the decay is not only modified by the character of the tooth, but is dependent, also, on the nature of the agent producing it.

The roots of the teeth are less liable to decay than the crowns. They sometimes remain firm in their sockets long after the latter are lost, but being of no use, and a source of irritation besides, nature exerts herself to expel them, by filling up and wasting away the sockets. The roots of the molars and bicuspid are more likely to be thus displaced, than those of the front teeth.

The liability of the teeth to caries depends on their texture, form, and arrangement, and these, as already noticed, depend on the state of the constitution at the time of their development and ossification. This liability is not increased, as many suppose, by severe and protracted disease, or the use of certain medicines changing the physical texture of the tooth. The secretions of the mouth often become so vitiated, by these agencies, that they act chemically on the teeth.

The teeth gradually increase in density as life advances, hence the young are more likely to suffer from caries than the aged.

CAUSES.

It was formerly maintained that caries of the teeth has the same origin as that of other bones. But as there is no analogy between the two, and as the treatment, to be of any use, must be totally and essentially different, the idea is now abandoned. No sane person would think of curing an ulcer in ordinary bone, by filling it with gold, yet this is just the treatment for a carious cavity in a tooth.

The decay of the teeth, then is not produced by inflammation of their bony structure, but by the action of external chemical agents. The disease never commences in the interior of the tooth. A mere crack or defective point in the enamel may admit an agent capable of destroying the tooth bone, yet not sufficiently energetic to corrode the enamel. Almost the entire body of the tooth is thus frequently destroyed while the greater part of the enamel is still standing.

Most of the acids destroy both the enamel and the dentine. The acetic, citric, etc., are frequently used as condiments, and some others are used as medicines. Many fruits contain acids sufficiently concentrated to corrode the teeth. But as the saliva, in its healthy state is alkaline, it is probable that the acids of fruits and condiments do not so frequently produce caries, as those generated in the mouth by diseased secretions, or the fermentation of extraneous substances about the teeth. This idea is in accordance with the well known

fact that any acid at the time of its formation or liberation, acts with far more energy than the same acid in its ordinary state.

The alkalies do not act on the enamel, but destroy the dentine, by combining with its animal matter.

For the prevention of caries, there is nothing like cleanliness. Teeth that can be kept thoroughly clean may be preserved sound through life. The configuration and arrangement of some render this impossible, yet such teeth can be preserved much longer with proper attention, than without it.

The proper instruments for cleansing the teeth have been already mentioned. A pure soap is sometimes used with advantage. If stains or deposits appear on the enamel, the dentist should be consulted, in order to have them promptly removed, either by instruments or by a suitable dentifrice.

TREATMENT.

This disease can always be arrested, if taken in time. The treatment, however, requires both skill and judgment, and to be effective, must be thorough, for the recuperative powers of the constitution do nothing toward its cure, while in diseases and wounds of the general system, there is a constant and vigorous effort at restoration.

When the gums and periosteum are inflamed, or otherwise diseased, they should be restored to a good degree of health, before any operation for the arrest of caries is resorted to. And here again is a call for patience and punctuality on the part of the patient. Some desiring operations, and fancying their judgment better than the operator's are impatient at the delay, and grudging the time or trouble of returning, either neglect the matter altogether, or call on a less responsible practitioner, whom they can induce to comply with their wishes. The loss of the tooth is certain in the one case, and probably in the other.

Two operations are resorted to for the arrest of caries—that of filing, when the disease is superficial, that of plugging

or filling, when deep seated. The one is also used sometimes as a preparatory step to the other.

FILING THE TEETH.

This important operation is but little understood, and there is, therefore, a very strong and general prejudice against it. When properly performed, no operation is more beneficial, or better calculated to accomplish the end sought by it. Like all other reliable remedies, it is productive of great injury when missapplied.

The enamel by its hardness and indestructibility, protects the tooth from the action of corrosive agents, hence, when sound it should not be interfered with, by the file or any other means. But when caries has commenced, its integrity of course is lost, and the question then is the relative advantages of a surface, already rough and diseased, or one healthy and smooth, as produced by properly filing off the superficial decay. The former affords a lodgment for foreign substances and vitiated secretions, and cannot possibly be kept clean, while the latter is kept so without any difficulty.

Teeth are frequently filed when they, or the surrounding parts, are inflamed and this is often attended with bad results. They are sometimes filed to relieve a crowded or irregular condition, and as this too results in mischief the popular prejudice is not hard to account for.

The operation should be practiced only for the removal of actual disease, and in preparing for the operation of plugging.

Of the manner of using the file, it is not necessary to speak, as that is the business of the operator.

It is his place to make a thorough removal of the decay, when superficial, and in all cases, to leave the filed surface smooth and well polished. Then it is the patient's place to keep it clean, to see that no extraneous matter remains in contact with it. By such attention, a filed tooth will last many years and perhaps through life.

In some cases it is necessary to file away a considerable portion of the tooth, but the operator aims, as much as possible to preserve the symmetry of the labial surface.

The sensation produced by filing the teeth is unpleasant, and sometimes painful. A little firmness and perseverance will generally enable the patient to bear it. The pain is trifling, compared with the consequences of neglect.

The decay can often be removed more pleasantly and with greater facility by strong, sharp and properly shaped cutting instruments, but the fine file and polishers will still be required to give a smooth dense surface to the exposed bone.

FILLING TEETH.

This operation, properly performed, constitutes the only remedy for deep seated caries. It is very difficult to perform; and to be effective, must be thoroughly and perfectly executed. When improperly done, it is worse than useless. It should be resorted to before the disease has reached the pulp cavity, as the preservation of the tooth is less certain afterwards, and besides, the operation is more tedious, painful and expensive.

Patients often suppose that the nerve or pulp is exposed when the disease has made but slight progress. The tooth is sometimes exceedingly sensitive from inflammation of the dentine or tooth-bone, and from this arises their mistake. When this is the case, the removal of the decay and the preparation of the cavity, causes some pain, and after the tooth is filled, there is for a while, some uneasiness when anything hot or cold is taken into the mouth. If the pain be not great the patient had better bear with it, but if too severe, it may be mitigated by remedial agents. The sensibility to heat and cold is sometimes prevented, by placing some non-conducting substance in the bottom of the cavity before introducing the gold.

Several conditions are requisite to the successful performance of this operation. The mouth should be free from inflammatory action, and the tooth from pain and irritation.

A variety of instruments properly constructed, and a suitable metal properly prepared, are also necessary.

Quite a number of substances have been used for filling teeth.

Tin, beat into thin leaves called tin foil, is in common use. When well inserted it sometimes preserves the tooth, but when the fluids of the mouth are vitiated, it frequently oxydizes and turns black, and then, instead of preventing, it promotes disease. The secretions may be healthy, at the time of its introduction, and afterwards, become diseased; it is therefore, unsafe as well as uncertain. It is often used on account of its cheapness, but like many other cheap things, it often proves a hard bargain at any price. It is however, far the best of the "cheap fillings."

Silver is harder to introduce than tin, and at the same time is more readily oxydized by the acids of the mouth. It is almost abandoned, and should be entirely.

Gutta percha is sometimes used for temporary fillings, and with good results, but it is by no means reliable as a permanent plug.

Amalgam, called "mineral cement," "lithodeon," etc., has been used very extensively. It is composed of mercury, combined with silver, and sometimes with other metals. Various formulas have been used, but the results are nearly the same. It is easily inserted, is retained in any cavity, and costs but a trifle, it is therefore liable to great abuse.

It is rapidly oxydized, and by the galvanic action thus set up on its surface, the fluids of the mouth are decomposed. Agents capable of corroding the teeth may be thus eliminated from healthy saliva. The mercury may also act injuriously on the constitution. An amalgam plug, weighing forty grains contains as much mercury as one dram of blue mass, or is equal to twenty blue pills, of the ordinary size. A large proportion of the best informed dentists rejected it entirely while others use it only in teeth too far gone to be filled with foil. None but the base and ignorant use it indiscriminately.

Platinum resists the action of acids better than any other metal, but it is more difficult to introduce and consolidate than gold. It may be used both in foil and sponge.

Gold is by far the best, and is perhaps, the only material which should be relied on, for permanent operations. A tooth that can be saved at all, is worth filling with gold. As it is the only reliable material for this purpose, it is cheaper in the end, than any other. It is not wise, therefore, to insist on cheap operations, and cheap material, against the better judgment of the operator.

Gold is used in the form of foil, sponge and crystals, and perfect fillings may be made with it in any of these conditions. It should be perfectly pure and well annealed. It may then be pressed into all the inequalities of the cavity, and rendered so firm and solid that it will exclude moisture, and even the atmosphere.

The preparation of the cavity for receiving the gold is an important part of the operation. A variety of instruments are required for this purpose. The removal of the decay is seldom all that is necessary. The cavity must be shaped so as to retain the filling.

When the caries is situated on the approximal surfaces, the teeth have mostly to be separated, before the decay can be removed, and the cavity filled. This must often be done with a file, as previously intimated. In young persons it is often practicable to separate them by pressure, applied by means of wedges of soft wood, pledgets of cotton, or pieces of India rubber, pressed between them. The principle by which this is accomplished was explained when speaking of the treatment of irregularity. After the operation, the pressure is removed, and the teeth resume their natural position.

A number of instruments, of various shapes, is also required for introducing and condensing the gold. These are modified, to some extent, by the form of gold used. A description of them would interest none but the professional reader.

The time occupied by a good operator, in excavating and filling a tooth properly, varies from thirty minutes to several hours.

For the success of the operation, it is necessary that both the cavity and the gold be kept perfectly dry. This is sometimes very difficult. Much depends on the tact and skill of the operator, and much also on the deportment of the patient. It is sometimes necessary to assume an uneasy posture, and to maintain it for some time, but the result will amply compensate the patient for such discomfort. In general, the operation causes but little uneasiness.

When the decay has reached the central cavity, the operation is somewhat modified. If the pulp remains healthy, various methods of filling over it are resorted to, any of which are likely to succeed in the hands of good operators. If, however, the pulp be too much diseased for this kind of treatment, it becomes necessary to remove it altogether. To accomplish this, it is sometimes destroyed by corrosive agents, at other times, it is removed at once by an appropriate instrument. As soon after this as practicable, the tooth should be thoroughly filled, to the extremity of the fang. A tooth thus treated may remain permanent and useful for many years, yet the disease should be arrested, in all cases, before it reaches the central cavity.

TOOTH-ACHE.

It is scarcely necessary to describe this disease. Most persons have experienced it, and words would be thrown away on those who have not, for language can give no adequate idea of its torments.

It sometimes begins with a slight pain, and gradually increases to the severest agony; at other times, an intensely sharp pain, shooting from the affected tooth to the jaws, face, temples, eyes, or ears, is the first intimation of its presence. The pain, in some cases is deep-seated and throbbing, in others, slight, and apparently superficial. Sometimes it is continuous, and sometimes intermittent, both the paroxysms

and intervals being of uncertain duration. The pain is mostly confined to the tooth producing it, but sometimes it passes to others. The cause often exists in one tooth, while the pain is felt in another.

CAUSES.

The causes of this malady are disease within the tooth, disease within the socket, and a transfer of nervous irritation. The disease in the tooth may be either irritation or inflammation of the pulp or lining membrane; that in the socket, inflammation of the periosteum, or investing membrane.

The character of the disease is, of course, modified by its origin. Indeed the term tooth-ache includes several diseases, differing not only in their origin, but also in their nature and treatment.

The pulp is more likely to become inflamed than the investing membrane, for it is more liable to be exposed to the action of irritating substances, through the decay of the teeth. Inflammation here, too, causes far more pain, for the walls of the cavity allow of but little distension of the vessels of the pulp, hence, the pressure on its nervous fibrils causes intense suffering.

Disease of the pulp, is mostly produced by the contact of irritating substances, such as particles of food, portions of decayed teeth, vitiated secretions, &c., and it is sometimes brought on by mechanical violence, and, perhaps, by other agents.

From the intimate connection of the pulp and lining membrane with the investing membrane, inflammation is readily extended from the one to the other. When the investing membrane inflames, it becomes thickened, and raises the tooth slightly from its socket, causing it to strike its antagonist, before the other teeth meet.

Inflammation of this membrane may be produced by disease of the gums, depositions of tartar, the use of mercurial medicines, cold, mechanical violence, &c. It is far less painful than disease of the pulp.

While the inflammation is confined to the pulp and lining membrane, the pain is not increased by pressure on the tooth, nor does the tooth protrude from its socket. But when it has extended to the investing membrane, the tooth, as already stated, is elongated, and pressure upon it greatly increases the pain.

But tooth-ache is often occasioned by a morbid sympathy between the teeth and the other parts of the body. Persons of a nervous temperament are peculiarly liable to this form, and it more frequently attacks females than males. It is often the result of a disordered state of the stomach or liver, and is frequently produced by malarious influence; hence, periodical tooth-ache is common in aguish districts.

This form of the disease is paroxysmal, the attacks and intervals being of uncertain duration, in most cases, but sometimes strictly periodical. It attacks sound teeth almost as frequently as decayed ones. The pain is sometimes very acute and sometimes dull and heavy. The patient is often unable to point out its precise location, for it is often transferred from one tooth to another, with great rapidity, traversing, sometimes, the entire arch.

TREATMENT.

The treatment of this disease must necessarily vary with the nature of the causes producing it. If the affected part be the pulp, or lining membrane, and it is already exposed, very decided relief, for the time, is often afforded by introducing into the cavity some anodyne or astringent remedy. Tincture of opium, or camphor, is sometimes used with success. Some of the essential oils are used in the same way; a favorite of these is the oil of cloves; that of tobacco is very powerful, but is totally unsafe, and should never be administered. A pledget of cotton saturated with chloroform often gives instant relief, and if some gutta percha be previously dissolved in the chloroform, the relief is equally prompt, and the cavity is, to some extent, protected against the entrance of irritating substances.

A favorite prescription with many is:—

Sulphuric ether, one ounce,
Camphor and alum, each one drachm.
Mix and apply on pledgets of cotton.

This is an admirable application for children's teeth. A solution of camphor in chloroform may be used in the same way. As the chloroform evaporates the gum is deposited over the pulp and thus temporarily protects it from irritants. The same thing takes place with the ether and camphor.

Creasote is a very popular remedy, and often affords decided relief. It is frequently used in conjunction with other medicines. The following recipe is perhaps as good as any of this kind:—

Sulphuric ether, one ounce
Creasote, one-half drachm
Tannin, one drachm,
Camphor, two drachms.
Mix and use as directed above.

On account of its energetic action on the animal portion of the dentine, creasote has a tendency to accelerate the decay of the tooth in which it is inserted. The same is probably true of the essential oils.

The relief afforded by these means is, in many cases, of a temporary nature, but most persons of experience will agree that even temporary relief is a great blessing when tooth-ache is the malady on hand.

While these local means are used, measures of a more general nature should be resorted to. The patient should avoid exposure, keep the extremities warm, use light diet and take cooling laxatives. The gums should be freely scarified, and warm fomentations should be applied to the face.

The above remedies have little or no tendency to destroy the pulp. They are used either to give temporary relief, or to aid in restoring the health of the organ. When milder means fail, the destruction and removal of the pulp become necessary, in order to save the tooth, for otherwise, the disease will return with such frequency and severity as to become altogether insupportable.

Sometimes the pulp inflames and suppurates when it is not exposed. The pain which is very intense, may be relieved by perforating the tooth with a drill, to give egress to the confined matter.

When the pain arises from inflammation of the investing membrane, as may be known by the tenderness on pressure, and by the elongation of the tooth, all irritants should be removed, the gums should be freely scarified and the bleeding encouraged, leeches when accessible, may be used with advantage. The constitutional treatment recommended for the preceding variety, should be used with increased energy in this, and after the inflammation has somewhat abated, the mouth should be frequently washed with a stimulant and astringent lotion.

When the disease is occasioned by transferred nervous irritation, local treatment is of but little use. If it results from malaria, or long continued nervous irritation, tonics, anti-periodics, bathing, change of air, and other means of invigorating the constitution, should be resorted to. When dependent on derangement of the stomach or liver, a cathartic often affords relief. If the pain be situated in badly decayed teeth, it is proper to remove them, for they often invite the transfer, but, if confined to sound ones, little or no relief is to be expected from their extraction.

The reader will now understand that there are at least, three distinct varieties of toothache, and that in truth, they are as many distinct diseases. The opinion is very prevalent that when the nerve or pulp is dead, or removed, the tooth will not ache. Dentist are frequently asked to "destroy a nerve," for the relief of tooth-ache, when the pulp of the offending organ has been lost for months or years. Indeed the second variety of the disease commonly attacks just such teeth.

The first and second forms mutually induce each other. Disease of the pulp and lining membrane is very often extended, through the orifice in the apex of the fang, to the den-

tal periosteum, and a like transmission sometimes takes place from the external to the internal membrane, or pulp. In the first case, the pulp is usually dead before the periosteum becomes inflamed.

When the pain in a diseased tooth becomes intolerable, extraction is the remedy. And if the tooth be decayed so as to prevent its restoration to usefulness, it should be removed as soon as the disease is manifested, for delay only adds to the suffering, and procrastination never mitigates the severity of the operation.

EXTRACTION OF TEETH.

From the persons employed and the instruments used, it is evident that the extraction of a tooth was formerly considered an unimportant operation. The blacksmith, barber, butcher and physician, with formidable turnkeys and huge "nippers," were the acknowledged "knights of the tooth-ache," and, their titles derived from *royal extraction*, they whirled out the offending organs, in true "cant hook" style.

No wonder then that this operation excites stronger feelings of dread, and is submitted to with greater reluctance than almost any other. Many endure for months, all the untold tortures of tooth-ache, through dread of mangled gums and broken jaws, their fears excited to the highest pitch, by the daily accidents resulting from inappropriate instruments, in the hands of the ignorant and unskilled.

It is scarcely necessary to say that with suitable instruments in skillful hands, the operation is always safe, and seldom very severe. It is a matter of surprise that so important an operation was for years, and in many cases, still is intrusted to hands so unskillful. And the fact of physicians and surgeons attempting it with such instruments, proves the necessity of making dental surgery a separate and distinct profession, their minds are so thoroughly preoccupied with other operations, that they cannot give this one due attention.

Though great improvements have been made in the construction of instruments, yet serious accidents are of almost daily occurrence, from the unskillfulness of operators. Though not strictly pertaining to the province of the physician, yet the operation must be frequently performed by him. It would be well therefore, for a physician who resides where the services of a good dentist are not at command, to get a suitable set of instruments, and familiarize himself with the mode of using them.

The indications calling for extraction have been already noticed, to some extent. A few additional remarks will perhaps, be profitable.

When a permanent tooth is about protuding through the gums, or has actually emerged before or behind the corresponding temporary, the latter should be at once removed, and it is occasionally necessary to extract an adjacent temporary to make room for the permanent organ. But the proper course in such cases, has been already pointed out. Tooth-ache which cannot be otherwise relieved, alvcolar abscess, and disease of the alvcolar process, may be also regarded as indications for the removal of the temporary teeth.

Of the permanent organs, a tooth causing an abscess should in most cases, be extracted. But if it be an important tooth, and the discharge of matter small, and occuring only at intervals, it is proper to let it remain. A bicuspid or molar is more likely to require removal when so diseased, than a front tooth.

When a molar has become partially displaced from the loss of its antagonizing teeth, and is a source of irritation to the adjacent parts, it should be removed.

Irregularity resulting from a disproportion between the size of the teeth and the alveolar arch, calls for extraction. The proper teeth to be removed have been pointed out, in a previous chapter.

In general a fetid discharge through a carious opening in a tooth, if long continued may be considered an indication for

extraction. This discharge, however, may be sometimes arrested by appropriate treatment, and the tooth by proper filling, made to last several years, without injury to the surrounding parts, or the general system.

Teeth much loosened by the destruction of their sockets, dead teeth, and decayed roots, are each a fruitful source of disease, and should therefore be removed, without hesitation.

It has been already remarked that intolerable tooth-ache is an indication for extraction, except when the pain results from a transfer of irritation, and is situated in healthy teeth. Other indications might be mentioned but space forbids.

As most persons who live to maturity are experimentally interested in the operation of extraction, a brief account of the instruments used, in the performance of it, may be interesting, as well as edifying.

The common tooth key, was for a long time, almost the only instrument used, but it has been, to a great extent, superseded by forceps, which most practitioners consider far preferable, when properly constructed.

The reader has, no doubt, seen the key, if he has not felt it. It has various forms, some of which are preferable to others, but the principle of action is the same in all. The straight and the bent shaft, the round and the flat fulcrum, the bifurcated and the serrated hook, have each had their advocates.

A large majority of the best practitioners seldom use the key, and many of the most eminent never do. It is indeed strange that it has ever been extensively used.

On account of their bad shape and imperfect adaptation to the teeth, forceps were not generally used to extract any but the front teeth, till within a few years, but the improvements made in their construction are so decided, that they have almost superseded the key, especially among dental practitioners. Before these improvements, the removal of a large molar with the forceps was considered both difficult and dangerous.

Many suppose that it requires more force to remove a tooth with the forceps than with the key, but it requires less. Great power may be applied by the key, but it cannot be made to act in the right direction, hence, the gain, by its lever action, is lost, by the lateral direction of the force.

That forceps may be used with ease and success, they must be of a proper construction. Various shapes are required, with beaks accurately fitted to the necks of the teeth to be extracted by them, and sufficiently thin, to pass readily between the necks, and the margins of the gums. The handles should be strong and perfectly adapted to the hand.

As the forceps are made for grasping the neck of the tooth and not the crown, the operator aims to seize the tooth as near the margin of the process as practicable. This being generally beyond the decay the tooth is less likely to be crushed or broken. When the tooth is much decayed, it is sometimes proper to seize the thin margins of the process, and cut through them with the blades of the forceps, for the sake of a firm hold on the tooth, for nothing is so annoying and discouraging to a patient as a failure in extracting. The small portion of the process thus removed is of no consequence, for the whole of it is taken away by absorption, after the removal of the tooth.

In most cases the teeth least difficult to extract are the upper incisors. The canines require a much greater force. The upper molars having three roots, require generally more force than the lower, which have but two. Much however depends on the direction, size and form of the fangs, and on the thickness and density of the process.

The principal strength of the socket depends on its anterior and posterior walls, the approximal being thin and not very dense. But when a tooth becomes isolated in a healthy mouth, a deposit of bony material strengthens and consolidates the approximal walls, causing the tooth to stand very firmly in place. On this account the canines, which are often so situated, are extracted with difficulty.

The extraction of the roots of teeth is often difficult, but generally less so than whole teeth. This is especially true of the bicusps and molars, for after the loss of their crowns, the roots are gradually expelled by the absorption of the processes, and the filling up of the sockets. This takes place to such an extent, that often, in two or three years after the loss of the crowns, the sockets are wholly obliterated, and the roots are retained only by their attachment to the gums. They are then, of course, easily removed, a lancet or sharp pointed knife being the only instrument needed, in many cases.

A great portion of the roots can be better removed with the forceps than with any other instrument, but others will be found useful, in many cases, and almost every practitioner has his favorites.

The extraction of the temporary teeth differs but little in mode, from that of the permanent ones. In general, very little force is required. They should be removed with the utmost care to avoid injury to the process and to the germs of the permanent organs.

HEMORRHAGE AFTER EXTRACTION.

The loss of blood from the extraction of a tooth, is generally very slight, but sometimes it is excessive, and has been known to terminate fatally.

This excessive hemorrhage does not at all depend on the manner in which a tooth is extracted, but on the constitutional condition of the patient.

The hemorrhagic diathesis seems to prevail in some families. When one member is so affected, the rest are likely to be. Persons of this diathesis will bleed excessively from the slightest wound, and might lose their lives by the scratch of a pin.

Every patient knowing himself to be thus predisposed, or if he is even aware that any of his near relatives are so, should mention the fact to his dentist before having a tooth extracted, that he may adopt the proper precautionary mea-

tures. In all such cases, unless there be intolerable tooth-ache, the operation should be postponed, and the constitution modified and invigorated by the use of appropriate tonics and astringents.

The local means for the arrest of this hemorrhage are pressure and astringent applications. The sockets should be filled with pledgets of lint or cotton, saturated with the solution or tincture of tannin, or some equally prompt astringent. A compress may be placed over these, and the mouth closed upon it. The pledgets and compress should be allowed to remain a considerable time, and unless constitutional treatment has been employed previous to the operation, it should now be vigorously pushed.

Hemorrhage from extraction seldom proves unmanageable. It mostly ceases soon after the operation, and in cases where it becomes excessive, it seldom excites alarm till a few hours have elapsed. When it gives cause for alarm, the operator should be immediately notified. A few minutes attention is generally all that is required.

CHAPTER VII.

HINTS ON ARTIFICIAL TEEEH.

As the teeth give form to the features, and expression to the countenance, as they aid in enunciation, and are principal organs of mastication, their loss is a serious misfortune. And as it is common, as well as serious, it is not strange that art is called on to make reparation.

The natural teeth are of course, vastly superior to anything art can produce, and they should ever be cherished as choice gifts from a bounteous Creator, yet few persons arrive at adult age, without losing some of them.

But though art cannot equal nature, still she can do something. She can furnish teeth so like the natural organs that any but the most practiced eye will be deceived by their appearance, and she can adapt them to the mouth, so as to sub-

serve, though in an inferior degree, all the purposes of the natural organs.

The insertion of artificial teeth is an important operation and one requiring great practical skill. True, almost any one can insert teeth, but a large proportion of those inserted prove a curse rather than a blessing. A tooth badly inserted is often the means of destroying the two adjacent ones, and the same want of skill, in supplying this deficiency, will be as likely to destroy two more.

To be useful, artificial teeth must be properly constructed, and correctly applied. they must correspond with the features, the countenance and complexion, and must be adapted to the mouth and to the natural teeth, if any remain. Accuracy of judgment is therefore essential, for as no two mouths are alike, as the features and countenances ever vary, each operation requires new skill, adapted to its peculiar circumstances.

Various substances have been employed in the formation of artificial teeth. The crowns of human teeth were formerly used to a considerable extent. When properly adapted, they have a very natural appearance, at least as far as form is concerned. They lack the lively appearance of the living organs. Their durability depends on the soundness of their enamel, the density of their structure, and the condition of the mouth in which they are inserted. They are more liable to decay than the living organs. For this reason, and from the impossibility of obtaining them in sufficient numbers, their use has been abandoned.

Ivory, from the tusks both of the elephant and hippopotamus, has been very extensively employed, and is still used to some extent. Of the two kinds the hippopotamus is the best. Teeth may be carved from it that will, at first, resemble the natural organs, but they soon change in the mouth, becoming first yellow and afterward a leaden, or dark bluish color. They are very liable to decay, and besides, they soon become very offensive, tainting the breath with a most intolerable odor. This cannot be prevented, nor can the secretions of the mouth be kept healthy while they are worn.

Porcelain teeth have about superseded every other kind. They are a French invention, but they did not promise much, nor become generally used, till greatly improved by American dentists. The French teeth of the present day are far inferior to those of American manufacture.

The principal ingredients of which these teeth are composed are feldspar, silix or quartz, and kaolin or porcelain clay. These are finely pulverized, mixed in the proper proportions, made into paste by mixing with water, moulded into the desired shapes, and baked in a furnace, with sufficient heat to fuse the materials. The various shades and colors are given them, principally by metallic oxyds. These are varied in quantity and kind, according to the colors desired.

MODES OF APPLYING ARTIFICIAL TEETH.

There are several methods of inserting artificial teeth. When the practitioner has duly considered the age, temperament and constitution of the patient, when he has ascertained the state of the mouth and the condition of the teeth, he is ready to decide on the proper mode of performing a proposed operation. The mode of operating must be governed by the nature and circumstances of each case.

When considered in relation to their insertion, artificial teeth naturally divide themselves into two classes—pivot, and plate teeth. The former are inserted on the roots of the natural organs; the latter as their name imports, are attached to plates adapted to the mouth. The plate is held in place by clasps, springs, or by the pressure of the atmosphere. The advantages and disadvantages of the various modes will be briefly considered.

The natural organs are, perhaps, better imitated by pivot teeth, inserted on the natural roots, than by any other means, but the plan is adapted only to the front teeth. When the roots are sound and healthy, and the posterior teeth are still retained, pivot teeth subserve the purpose of the natural organs, to a good degree of perfection.

The insertion of pivot teeth is often practiced under the most unfavorable circumstances, and as frequently, the operation is carelessly and inefficiently performed. Much inconvenience and suffering have been the necessary result, and the operation is therefore somewhat unpopular. The insertion of a tooth on a diseased root, or one in a diseased socket is always followed by bad consequences. Even the preparation of a healthy root may give rise to irritation or inflammation, requiring a postponement of the rest of the operation.

As the insertion of teeth on pivots is adapted only to the upper front teeth, and to these only when the roots remain

and are healthy, other methods must be resorted to. Hence the necessity arises for plate teeth.

PLATE TEETH.

These are not confined, like the above, to the replacement of a single class of the natural organs, but are applicable to all. When properly constructed, teeth inserted on plate will last many years, and often through life. To be durable, the plate must be sufficiently strong, and properly adapted to the mouth, and the teeth must be correctly arranged, accurately fitted, and substantially secured to the plate.

Gold and platinum are the only metals fit to be employed in permanent operations. In many mouths, no other metals should be used under any circumstances.

Pure gold is too soft for plates, and hence it must be alloyed to give it the necessary hardness. If it be reduced too much the fluids of the mouth will act upon it.

The fineness of gold is commonly expressed by *carats*. The term is a relative one. Any quantity of gold, under consideration, is supposed to be divided into twenty-four parts, and each part is called a carat. Pure gold is therefore said to be twenty-four carats fine. That containing twenty-two parts of gold and two of alloy, is called twenty-two carat gold. If in the twenty-four parts there be six of alloy, it is called eighteen carats, if one half alloy, it is twelve carat, and so on.

Gold of from nineteen to twenty-one carats is the best quality for plates. It is often worked lower, but it is liable to corrode in the mouth, and if it does, galvanic decomposition of the fluids of the mouth is the certain result.

Silver and copper are the metals mostly used in alloying gold for plates. Platinum with gold makes a strong, elastic alloy very suitable for clasps, and it is sometimes used for plate, but the deadness of its color is an objection with some.

Platinum for indestructibility, surpasses gold. In color it resembles silver. It is soft and very flexible. It costs considerably less than gold, but from the difficulty in melting it there is a greater waste of scraps and filings. The "continuous gum" work is mounted on this metal.

When but a partial set of teeth are to be inserted, the plate is often held in place by clasps soldered to it, and fitted to some of the remaining natural organs. Teeth properly inserted in this way are very serviceable, may be worn with comfort, and can be removed from the mouth, cleansed, and

replaced at will. To be durable the plate must fit the mouth accurately, and the clasps must be attached to healthy teeth which stand firm in their sockets.

When the natural organs are all lost, of course, clasps are inapplicable, and even if some of them remain, they may not be fit to retain clasps. In such cases, spiral springs are sometimes used to hold the plates in their proper positions. The teeth are connected with the plate, as in the former method, and the springs are attached to the plates, one on each side, passing from one to the other, and resting between the teeth and the cheek. They are not used as extensively as they were.

The atmospheric pressure, or suction method of applying artificial teeth, is to some extent, superseding both the other modes. It was at first, supposed to be impracticable for partial sets, but is now often practiced, in the insertion of even a single tooth.

Any two substances impervious to the atmosphere, pressed together so as to force the air from between them, will adhere to each other. A metallic plate accurately fitted to the gums, may be made to adhere in the same way. When the air has access to both sides of a plate its pressure on the two surfaces is equal, but when excluded from one side, its entire weight presses on the other. This pressure, at the level of the ocean is near fifteen pounds to the square inch. It does not, therefore, require a very extensive plate when well fitted to retain a set of teeth in place.

This plan is altogether the preferable one when several teeth are to be inserted. It is sometimes attended with difficulty, in unfavorable mouths, but it is seldom that skill and judgment will not be able to overcome all obstacles. To be successful, every step in the process must be perfect in its nature. The mouth must be in the proper condition, the plate must fit perfectly, and the teeth must be correctly antagonized. All should be perfect too, when clasps or springs are used, but a slight defect does not in these methods, prevent the *apparent* success of the operation.

Before inserting a plate, by any method, it is necessary to have the mouth in a healthy condition. Dead teeth, roots and all extraneous substances should be removed.

The reader will bear in mind, that after the teeth are extracted, the alveolar processes are removed by absorption, so that the socket becomes entirely obliterated. This is a work

requiring time, and during its progress, the bone beneath the gums presents numerous rough, sharp projections, which cause any pressure on the gums to be painful.

Of course the shape of the alveolar ridge is undergoing a constant change during the period of absorption. On this account, a plate that would fit the gums, soon after the extraction of the teeth, would not be at all adapted to them, in a few months. This renders it necessary to wait till the absorption is completed before inserting the teeth. A delay of from six to twelve months is frequently necessary, but as the processes are often partially absorbed before the removal of the roots, a much shorter period often suffices.

As it is a serious inconvenience to do without teeth so long, it is often advisable to have a temporary set inserted. Though they will not be so useful, nor so comfortable, as those applied after the mouth is ready, yet they will be found much better than none. They greatly aid the speech and improve the appearance, and often serve a good purpose in mastication.

For temporary work pure silver is sometimes used, for the plates, and if the constitution is good, and the fluids of the mouth healthy, it may answer very well, but it should never be used for a permanent operation, or in a diseased mouth.

In supplying a number of teeth, in an unbroken series, there is seldom much difficulty in fitting the plate, but a perfect adaption is not so easily obtained when the loss of several teeth from different parts of the mouth, is to be replaced by substitutes attached to a single plate.

These few hints on mechanical dentistry, though no guide to the operator, may give the reader some general idea of the way in which artificial teeth are mounted, and may, to some extent, gratify the laudable curiosity which impels all to investigate anything in which they are interested.

And the reader will not fail to obtain some practical ideas from them. He will learn that a good operation must cost something, and that he can, by no means, afford to pay any price for a bad one. He will understand that "cheap dentistry" may be made profitable, in various ways. The gold used may be of fifteen, instead of twenty carats, the plate may be too narrow, as well as too thin, and the work may be done without that necessary care and attention which is always a heavy tax upon time. He will see the necessity of selecting a dentist who is both competent and honest.



